

REMARKS

Applicant respectfully requests reconsideration of the present application in view of the foregoing amendments and for the reasons that follow.

I. Status of the Claims

No claims are being amended or cancelled. After entry of this communication, claims 57-60, 62-76, and 79-80 are pending.

II. Claim Rejections – 35 U.S.C. § 103

a. Claims 57-59, 75 and 79 are rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Wu et al., *Adv. Mater.* (14(1), (2002), pp 64-67 in view US 2003/0224168 (“Mack”). Applicants respectfully traverse this rejection.

The claimed invention is directed to a substrate comprising a plurality of carbon nanosheets. Each of the plurality of carbon nanosheet has a thickness of 2 nm or less and the plurality of carbon nanosheets are aligned and stand on their edges roughly vertical to the substrate. None of the cited prior art teach the inventive carbon nanosheet.

The PTO asserts that Wu teaches a plurality of carbon nanowalls which are grown on a substrate and are aligned. The PTO relies on paragraph 2 on page 64 of the Wu article to teach nanowalls that stand on their edges vertical to the substrate. Contrary to the PTO’s comments, however, Wu does not teach the inventive carbon nanosheets.

If Wu had synthesized carbon nanowalls with a thickness of 2 nm or less, Wu would have reported these results in his article. Wu clearly recognized that carbon nanowalls with a well defined orientation and small thickness are important because of their applications in field emission displays and for energy storage. See page 67 of Wu’s article. Yet, Wu failed to teach or even suggest a nanostructure having a thickness of 2 nm or less.

Wu teaches that its nanowalls are hollow and have a cavity with a spacing of about 1 nm. By this very disclosure, Wu clearly showed possession of the analytical methods necessary to measure cavity spacing with a thickness as small as 1 nm. Yet, Wu fails to report nanowalls with a thickness of 2 nm or less, instead relying on the generic statement “10 nm or less thickness” to describe the thickness of its nanowalls. Taken together, these teachings provide compelling evidence that Wu could not have reported the manufacture of nanowalls having a thickness of 2 nm or less, because Wu did not achieve this result.

Mack is cited to remedy the deficiencies in Wu. See Office action at page 3. According to the PTO, it would have been obvious for the skilled artisan to configure Wu’s nanowalls to have a thickness as taught by Mack. The PTO has erred in making the suggested combination.

Mack teaches a method for manufacturing nanostructured materials that relies on creating a dispersion of carbon sheets by intercalating ions into carbon layers of graphite followed by sonication to exfoliate the carbon layers of graphite (*see, Mack, Abstract and Paragraph [0019]*). However, there is no teaching in Mack for assembling the dispersion of the carbon nanosheets to stand on their edges roughly vertically to a substrate as claimed.

In fact, Mack’s teachings for using sonication to generate its carbon nanostructures would have readily be understood by the skilled artisan to prevent the manufacture of a substrate having vertically aligned carbon nanostructures as recited by claim 57. This is so because the applied sonic energy is being concentrated on to a structure that is no more than a few atoms in thickness (for example to a nanostructure having a thickness of 0.34 nm), and therefore, may be unable to withstand the energetic force that is created during sonication.

Because Wu also fails to teach aligning carbon nanosheets to stand on their edges roughly vertically to a substrate, the combination of Mack and Wu would not have enabled the production of the inventive carbon nanosheets.

b. Claim 60 is rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Wu et al., in view of Mack and further in view of *Carbon*, (39) 2001 505-514 (“Peigney”).

Peigney is cited to teach “carbon materials...[that] have a specific surface area within the range recited in dependent claim 60. The PTO asserts that it would have been obvious to a person having ordinary skill in the art that the nanowalls taught by Wu and Mack would have a specific surface area within the claimed range. Applicants respectfully disagree.

Piegney fails to cure the deficiencies of Mack discussed above. Peigney is merely a theoretical study of specific surface area of single- and multi-walled carbon nanotubes and of carbon nanotube bundles. As stated in the MPEP and affirmed by the Supreme Court in *KSR Int'l Co. v. Teleflex Inc.*, (slip op. at 14), a determination of obviousness mandates the PTO to "identify a reason that would have prompted a person of ordinary skill in the relevant field to combine the [prior art] elements" in the manner claimed and specifically stated."

Here, where neither Peigney, Mack nor Wu teach or suggest a plurality of aligned carbon nanosheets that stand on their edges roughly vertically to a substrate, as claimed, the obviousness rejection is improper and must be withdrawn.

c. Claims 62, 63 and 76 are rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Wu et al., in view of Peigney, while claim 64 is rejected as allegedly being unpatentable over Wu et al., in view of Peigney and further in view of Mack. Applicants respectfully traverse both rejections.

Claim 62 recites a composition comprising a plurality of carbon nanoflakes having a specific surface area between $1000\text{ m}^2/\text{g}$ and $2600\text{ m}^2/\text{g}$, wherein the carbon nanoflakes are aligned, freestanding and stand on their edges roughly vertically to a substrate. The inventive composition is not taught, and moreover, cannot be arrived at using the teachings of the cited references for at least the same reasons mentioned above. That is, the combination of Wu and Mack, or Wu, Mack and Peigney fail to teach carbon nanosheets that are aligned and stand on their edges roughly vertically to a substrate, much less a composition comprising a plurality of the inventive nanosheets.

Accordingly, all pending claims are patentable and Applicants respectfully request the PTO withdraw the obviousness rejections.

CONCLUSION

The above remarks address the PTO's concerns on patentability. Therefore, Applicants respectfully request the PTO to provide an early indication to this effect.

Respectfully submitted,

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The Commissioner is hereby authorized to charge any additional fees which may be required regarding this application under 37 C.F.R. §§ 1.16-1.17, or credit any overpayment, to Deposit Account No. 19-0741. Should no proper payment be enclosed herewith, then the Commissioner is authorized to charge the unpaid amount to the same deposit account. If any extensions of time are needed for timely acceptance of papers submitted herewith, Applicant hereby petitions for such extension under 37 C.F.R. §1.136 and authorizes payment of any such extensions fees to the same deposit account.